Small-scale Forestry (2009) 8:399–410
DOI 10.1007/s11842-009-9091-5

RESEARCH PAPER

Local Knowledge on Tree Utilization and Conservation: The Case in Butigan, Baybay, Leyte, Philippines

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Accepted: 19 July 2009 / Published online: 1 August 2009

Abstract A survey of an upland village in the Philippines was conducted to assess local knowledge (LK) on tree utilization and conservation through personal interview of 40 local residents. The survey data were analyzed using descriptive statistics and simple preferential ranking. Respondents identified and classified 66 tree species according to their uses. Yakal, tugas, toog, narra and lauan were among the highly durable timber species identified. Several species for fuelwood, boat keel, furniture, post and fence, shade trees, food sources and medicine were also identified. In view of their utility, local people are inclined to conserve these species. However, illegal logging and kaingin farming are still threats to conservation and sustainable utilization of trees in the area.

Keywords Kaingin · Medicinal plants · Shade trees · Furniture-making

Introduction

The knowledge of indigenous people in using and nurturing biodiversity is generally astounding (Freeman 1998). Indigenous peoples have a vast wealth of knowledge about their environment built up over centuries. Not only does this knowledge concern various species of animals and plants, their behavior and uses, but also the way in which aspects of the universe inter-relate (Gray 1995). Hence, they are an enormous source of information that could contribute to the conservation of the remaining biodiversity frontiers in many countries, including the Philippines. Tapping the expertise of local communities in biodiversity conservation has a practical and ethical basis. Firstly, these communities have developed close

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familiarity with and are most knowledgeable about the biodiversity on which their everyday survival depends. Secondly, they are the ones to benefit directly or suffer from the consequences of resource management orchestrated by those internal or external to the local community (Campilan and Vega 1998).

The recent realization that indigenous or local knowledge systems have significantly contributed to biodiversity conservation was noted by the World Commission on Environment and Development in their 'Our Common Future' report (World Commission on Environment and Development 1987). The report pointed out that:

> 'Indigenous and tribal peoples are the repositories of vast accumulations of traditional knowledge and experience that links humanity with its ancient origins. Their disappearance is a loss for the larger society which could learn a great deal from their traditional skill in sustainably managing very complex ecological systems. It is a terrible irony that as formal development reaches more deeply into rain forests, deserts, and other isolated environments; it tends to destroy the only cultures that have proved able to thrive in these environments' (Chapter 4, Section 74).

While seemingly lacking the niceties of scientific methods, indigenous and local communities have effectively conducted real-life experiments of their relationship with nature. They have a body of knowledge considered important in today's efforts to shift to environment-friendly development (Ganapin 1998).

Rural people have been able to identify many species of plants which are capable of yielding various products, including food, medicine, fuel, forage, and tools (Vergara 1998). The Ifugaos of the Philippines can name more than 200 varieties of sweet potato and the Andean farmers cultivate thousands of varieties of potatoes (WRI-IUCN-UNEP 1992). Worldwide, medicines from wild products are worth an estimated $US40 billion a year; in all, 1,400 tropical forest plants yield chemicals with the potential to fight cancer, many of which may be driven to extinction before their promise could be assessed or tapped (Lean et al. 1990). It is now increasingly recognized that local knowledge is itself a resource for achieving the higher-order goal of biodiversity conservation (Campilan and Vega 1998). There is now considerable evidence that local people could be effective in managing biodiversity (Clay et al. 2000) as in the case in India where some villages protect and manage community forest to enhance the production of valuable non-timber forest products (Poffenberger 2000).

Remarkably, many plants and their uses are still unknown, signifying enormous potential that remains to be discovered. McNeely et al. (1990) estimated that there may be less than 5% of the biological diversity of the rainforests is known to science. Nebel and Wright (2000) pointed out that about 1.75 million species have been described and classified, but scientists estimate that up to 100 million still remain unidentified. Of the entire world's currently identified species, only 10–15% live in North America and Europe. The greatest diversity of organism species tends to be in tropical countries, especially in tropical rainforests (Cunningham et al. 2000). World Wide Fund for Nature (WWF) (2005) also stressed that the total number of species in existence is unknown and indigenous or local communities are

able to identify many of these species including their uses. The local knowledge of trees and forests of the people in Orissa in India have been found strongly consistent with scientific botanical knowledge (Seeland 2003). Sinclair and Joshi (undated) also observed similarities between local knowledge and scientific understanding. Local knowledge thus contributes to people's welfare and survival, and is worthy of documentation and application. In fact, a study in Ghana conducted by Koku (2005) demonstrates that local knowledge is incorporated into decision-making regarding adaptation of farming practices to changing rainfall patterns and also plays a role in influencing species preference.

The way of life of local people in Philippine upland areas is closely intertwined with their environment. Hence, this study was conducted to determine the local knowledge on tree utilization and conservation of a case-study upland community, to contribute to policy formulation for forestry, biodiversity conservation and environment-friendly development programs.

Research Method

The case study site of Barangay Butigan is located in eastern Leyte in the Philippines, about 7 km from the city of Baybay, at 124° 51′ longitude and 10° 40′ latitude. It has a total land area of 186.15 ha, of which 110.13 ha are agricultural and 76.02 ha are residential. About 70% of the area is flat, with the remainder slightly rolling to hilly with elevation ranging from 300 to 500 m above sea level. Rainfall is approximately uniformly distributed throughout the year.

A total of 40 respondents (a maximum of two per household, targeting mothers and fathers) were purposively selected, on the criteria that they were native to the area and wholly or partially dependent on forest resources for their livelihood. A questionnaire was developed and field tested twice to elicit socio-demography, local knowledge on trees, the conservation strategies and perceived problems in the area. The survey was conducted over two months by personal interviews using the local dialect. Socio-demographic data were analyzed using descriptive statistics while local knowledge on trees was analyzed using the preferential ranking method.

Results and Discussion

Socio-Economic Profile of Respondents

About 45% of the respondents reported ages range from 46 to 60 years, which implies that they are still active farmers. Most (87.5%) were married, 92.5% were males, and 60% had attained at least elementary education. Household size ranges from 1 to 12 (Table 1).

Sixty percent of respondents owned land, the remainder being tenants. About 35% had been farming for 30 years or more while 27.5% have been farming from 11 to 20 years. Their average annual income was PhP 22,500 (Table 2). Low

Table 1 Socio-demographic characteristics of the respondents in Butigan, Baybay, Leyte

Socio-demographic parameter	Level				
Age of the respondents	Below 30 years old	35–45	46–60	60 above	Total
Frequency	10	10	18	2	40
Relative frequency (%)	25	25	45	5	100
Civil status	Single	Married	Widow/widower		Total
Frequency	2	35	3		40
Relative frequency (%)	5.0	87.5	7.5		100
Gender	Male	Female			Total
Frequency	37	3			40
Relative frequency (%)	92.5	7.5			100
Educational attainment	Elementary	High School	College		Total
Frequency	24	15	1		40
Relative frequency (%)	60	37.5	2.5		100
Household size	1–3	4–6	7–9	10–12	Total
Frequency	4	18	12	6	40
Relative frequency (%)	10	45	30	15	100

income was attributed to small size of cultivated land and declining land productivity, as well as typhoons, drought and crop pests and diseases.

Local Knowledge on Tree Utilization

A total of 65 tree species were identified by respondents, and classified according to their uses. Twenty-nine species were used as lumber. Through preferential ranking, the respondents classified further the 29 tree species according to durability, as 13 highly durable, 8 durable and 8 less durable. Among the tree species considered as highly durable, Dipterocarps were the most numerous. Table 3 lists the tree species (all native to the Philippines) identified as used for lumber.

The 17 tree species listed in Table 4 were commonly used for fuelwood in the village. These were ranked according to combustibility. Rank 1 are those species that do not easily get burn unless dry, rank 2 are those species that burn fast when dry, and rank 3 are highly combustible species that burn rapidly even when not yet dry. The six species anagasi, ani-i, awom, batilis, dapdap and narra were considered highly combustible, although for narra (locally called naga) which is a premium[1] and a highly valuable timber only dead small branches and defective portions were used as fuelwood.

The respondents mentioned five tree species used for boat keel construction specifically for small and medium-sized fishing boats. Among these species, antipolo and lauan puti were considered the most durable, with lanipga and toog considered durable and marang less durable (Table 5).

[1] *Premium species* is a classification used by the Philippine Department of Environment and Natural Resources (DENR) for indigenous species warranting special protection.

Table 2 The economic profile of the respondents in Butigan, Baybay, Leyte, Philippines

Economic profile characteristic	Level					
Tenure status	Owner	Tenant				Total
Frequency	24	16				40
Relative frequency (%)	60	40				100
Years of farming	10 below	11–20	21–30	31–40	41 above	Total
Frequency	8	11	14	5	2	40
Relative frequency (%)	20	27.5	35	12.5	5	100
Annual income (PhP)	Below 10,000	10,000–20,000	20,000–35,000	35,000 above	Mean 22,500.	Total
Frequency	1	16	14	9		40
Relative frequency (%)	2.5	40.0	35.0	22.5		100

Table 3 Tree species used as lumber

Local name	Scientific name	Family name	Rank[a]
Abgaw	*Premna odorata*	Verbenaceae	1
Acacia	*Samanea saman*	Leguminosae	2
Antipolo	*Artocarpus blancoi*	Moraceae	1
Bahai	*Ormosia calavenis*	Leguminosae	3
Balaw	*Dipterocarpus grandiflorus*	Dipterocarpaceae	3
Batilis	*Leucaena luecocephala*	Leguminosae	2
Bawobo	*Diplodiscus paniculatus*	Tiliaceae	1
Bayong	*Afzelia rhomboidea*	Leguminosae	3
Dalinson	*Terminalia surigaensis*	Combretaceae	3
Dao	*Dracontomelon dao*	Anacardiaceae	3
Duguan	*Myristica philippinensis*	Myristicaceae	1
Guisok	*Hopea philippinensis*	Dipterocarpaceae	3
Hambabawod	*Neonauclea formicura*	Rubiaceae	2
Hamindang	*Macaranga bicolor*	Euphorbiaceae	2
Itoman	*Diospyrus pilosanthera*	Ebenaceae	3
Kaimito	*Chrysophyllum caimito*	Sapotaceae	1
Lanipga	*Toona philippinensis*	Meliaceae	2
Lauan pula	*Shorea negrosensis*	Dipterocarpaceae	3
Lauan puti	*Shorea contorta*	Dipterocarpaceae	3
Mango	*Mangifera indica*	Anacardiaceae	1
Narra	*Pterocarpus indicus*	Leguminosae	3
Sawong-sawongan	*For further identification*	For further identification	2
Sudyang	*Bredelia pinangiana*	Euphorbiaceae	1
Tagop	*Artocapus sp*	Moraceae	1
Tiga	*Tristania micrantha*	Myrtaceae	2
Toog	*Petersianthus quadrialatus*	Lecythidaceae	3
Tugas	*Vitex parviflora*	Verbenaceae	3
Ulayan	*Lithocarpus llanosii*	Fagaceae	2
Yakal	*Shorea astylosa*	Dipterocarpaceae	3

[a] Rank 1 low durability, 2 durable, 3 highly durable

Tree species mentioned by the respondents which were used for furniture making included the premium species of bayong, dao, mabolo, narra and tugas. Based on their observation from finished furniture products in their locality, respondents regarded these species as producing the most presentable and highest quality

Table 4 Tree species used for fuelwood

Local name	Scientific name	Family name	Rank[a]
Anagasi	*Leucosyke capitellata*	Urticaceae	3
Anagdong	*Trema orientalis*	Urticaceae	2
Ani-i	*Erythrina fusca*	Leguminosae	3
Awom	*Mallotus multiglandulosus*	Euphorbiaceae	3
Bahai	*Ormosia calavenis*	Leguminosae	2
Banitlong	*Cleistanthus pilosus*	Euphorbiaceae	2
Batilis	*Leucaena luecocephala*	Leguminosae	3
Biyanti	*Homalanthus populneus*	Euphorbiaceae	1
Dakit	*Ficus balete*	Moraceae	2
Duguan	*Myristica philippinensis*	Myristicaceae	2
Dapdap	*Erythrina variegata*	Leguminosae	3
Hagdan-uwak	*Polyscias nodosa*	Araliaceae	2
Langas	*Artocarpus heteropoda*	Moraceae	2
Macopa	*Syzygium samarangense*	Myrtaceae	2
Naga	*Pterocarpus indicus*	Leguminosae	3
Tal-ot	*Pterocymbium tinctorium*	Sterculiaceae	1
Tobog	*Ficus nota*	Moraceae	1

[a] Rank 1 low combustibility, 2 combustible, 3 highly combustible

furniture (Table 6). Nonetheless, in the absence of the premium species, inferior species were considered acceptable as alternative.

A total of 14 tree species were used for living fences and posts. These could not be ranked because respondents would use as the need arises any species available with suitable diameter and height (Table 7). Notably, the valuable lumber species of tugas, tiga, toog and guisok were also considered suitable for fences and posts.

Respondents mentioned 19 species of trees (Table 8) as sources of edible leaves and fruit, some are located on their farms and around their houses (though not in commercial scale) with others particularly libas and serali grow naturally in the forest. Ten of these are introduced species to the Philippines.

The respondents also motioned tree species used as medicine. Asunting was found useful against skin diseases caused by fungi including athlete's foot and skin discoloration due to Tinea fungus species. Leaves of asunting are ground into smaller pieces and directly applied by rubbing the affected portion of the body. Glyrecidia is used as an external muscle pain reliever, the leaves of which are heated to a tolerable temperature over a flame for a few seconds then applied directly to the affected area through rubbing and massage. In some cases, leaves are used as a poultice for sprains. Avocado, bayabas and kaimito on the other hand are used to cure stomach ache by drinking the decoction of leaves (Table 9).

The respondents also mentioned species commonly used as shade trees (Table 10). In view of its wide-spreading crown, acacia as the people commonly called it (referring to raintree) is a common shade species along water channels.

Table 5 Tree species used for boat keels

Local name	Scientific name	Family name	Rank[a]
Antipolo	*Artocarpus blancoi*	Moraceae	3
Lanipga	*Toona philippinensis*	Meliaceae	2
Lauan puti	*Shorea contorta*	Dipterocarpaceae	3
Marang	*Artocarpus odoratissima*	Moraceae	1
Toog	*Petersianthus quadrialatus*	Lecythidaceae	2

[a] Rank 1 low durability, 2 durable, 3 highly durable

Table 6 Tree species used for furniture making

Local name	Scientific name	Family name	Rank[a]
Bayong	*Afzelia rhomboidea*	Leguminosae	3
Dao	*Dracontomelon dao*	Anacardiaceae	1
Dalinson	*Terminalia surigaensis*	Combretaceae	2
Lamio	*Dracontomelon edule*	Anacardiaceae	1
Lima-lima	*Vitex turczaninowii*	Verbenaceae	2
Mabolo	*Diospyrus philippinensis*	Ebenaceae	3
Naga	*Pterocarpus indicus*	Leguminosae	3
Tiga	*Tristania micrantha*	Myrtaceae	3
Tugas	*Vitex parviflora*	Verbenaceae	3
Yakal	*Shorea astylosa*	Dipterocarpaceae	2

[a] Rank 1 fair quality, less presentable, 2 sound quality, presentable, 3 best quality, most presentable

Table 7 Tree species used for living fence and posts

Local name	Scientific name	Family name
Anagasi	*Leucosyke capitillata*	Urticaceae
Anislag	*Securinega flexousa*	Euphorbiaceae
Bahai	*Ormosia calavenis*	Leguminosae
Banai-banai	*Radermachera pinnata*	Bignoniceae
Bangkal	*Nauclea orientalis*	Rubiaceae
Duguan	*Myristica philippinensis*	Myristicaceae
Guisok	*Hopea philippinensis*	Dipterocarpaceae
Hambabawod	*Neonauclea formicura*	Rubiaceae
Lima-lima	*Vitex turczaninowii*	Verbenaceae
Tal-ot	*Pterocymbium tinctorium*	Sterculiaceae
Tiga	*Tristania micrantha*	Myrtaceae
Toog	*Petersianthus quadrialatus*	Lecythidaceae
Tugas	*Vitex parviflora*	Verbencaceae
Ulayan	*Lithocarpus llanossi*	Pagaceae

People washing clothes along the river take advantage of their shade against the intense heat from the sun. Cacao and mango also served as shade trees around the respondents' houses though primarily intended as sources of food.

Table 8 Tree species as source of food

Local name	Scientific name	Family name
Avocado[a]	*Persia americana*	Lauraceae
Balimbing[a]	*Averrhoa carambola*	Oxalidaceae
Bayabas[a]	*Psidium guajava*	Myrtaceae
Buwa-buwa	*Lansium domesticum*	Meliaceae
Cacoa[a]	*Theobroma cacao*	Sterculiaceae
Cape-cape[a]	*Coffea sp*	Rubiaceae
Durian	*Durio zibethinus*	Bombacaceae
Kaimito[a]	*Chrysophyllum caimito*	Sapotaceae
Libas	*Spondias pinnata*	Anacardiaceae
Mabolo	*Diospyrus philippinensis*	Ebenaceae
Macopa[a]	*Syzygium samarangense*	Myrtaceae
Manga	*Mangifera indica*	Anacardiaceae
Marang	*Artocarpus odoratissima*	Moraceae
Nangka[a]	*Artocarpus heterophylla*	Moraceae
Rambutan	*Nephellium lapaceum*	Sapindaceae
Sambag[a]	*Tamarindus indica*	Leguminosae
Santol	*Sandoricum koetjape*	Meliaceae
Serali	*Flacourtia jangomas*	Flacourtiaceae
Tambis[a]	*Syzygium aqueun*	Myrtaceae

[a] These species have been introduced to the Philippines

Table 9 Tree species used as medicine

Local name	Scientific name	Family name	Specific use
Asunting	*Herpitico elata*	Leguminosae	Skin disease
Avocado	*Persia americana*	Lauraceae	Stomachache
Bayabas	*Psidium guajava*	Myrtaceae	Stomachache
Kaimito	*Chrysophyllum caimito*	Sapotaceae	Stomachache
Madre de cacao	*Glyricidia sepium*	Leguminosae	Muscle pain

Table 10 Tree species used as shade trees

Local name	Scientific name	Family name
Acacia/raintree	*Samanea saman*	Leguminosae
Cacoa	*Theobroma cacao*	Sterculiaceae
Manga	*Mangifera indica*	Anacardiaceae

One of the species not found in the tabulated results is lita (*Alstonia scholaris*, fam. Apocynaceae). This tree grows naturally in the area and is used in coffin construction. Though soft, its lumber is highly suitable for wood-working.

Local Conservation Practices and Related Problems

The practice of conserving tree species is not new to the area, locals having practiced conservation in their own way since time immemorial. They gather only fallen logs and fall only dead and diseased trees for fuel and other uses. They also plant trees on their own farms and around their homes—as a food source and for shade, windbreaks, and protection against soil erosion—which enhances tree biodiversity of the local landscape. Their simple ways of survival and wise utilization of trees are indeed important conservation strategies. Over many years of experience, they have come to recognize at least 65 tree species that make a significant contribution to their socio-economic condition. Species other than this group, of little utilitarian value, continuously providing environmental services to the community. However, while some community members are satisfied with their economic condition, others are still in search for additional income out of urgent need or persistent poverty.

Two notable threats to tree conservation in the village are illegal cutting and slash and burn farming system. Illegal cutting takes place despite the logging ban imposed by the Department of Environment and Natural Resources. Respondents mentioned that some people outside the community come into their barangay and cut trees without the approval of the barangay captain. This situation has caused frustrations among the local residents.

Due to low income from the land presently cultivated by the barangay residents, some engaged in slash and burn farming (the kaingin system) as a supplementary source of income. This activity is a threat to tree conservation because some trees in the sloping areas are cut and replaced with agricultural crops. Even the less valuable trees are cut in the process. The need to survive is the driving force for kaingin farming still being prevalent in the area.

Conclusion and Policy Implications

Local knowledge indeed contributes a large amount of valuable information, including about tree utilization and conservation, to the scientific community. This information has proved how local communities—such as in the case of Butigan—are able to utilize and conserve their forest resources in a sustainable manner. Butigan residents were able to identify tree species useful for lumber, fuelwood, boat keels, furniture, fences and posts. They were also able to identify tree species as sources of food, medicine and shade, as well as simple but valuable conservation strategies. Their practical experiences over many generations has generated indigenous knowledge about some of nature's enormous wealth that is indispensable for human survival. At the same time, they expressed concern about illegal cutting and kaingin farming which they viewed as major obstacles to conservation of the remaining forest resources in the barangay area.

This study revealed that there are tree species that make a significant contribution to the survival of local people. These species warrant priority for reforestation or plantation establishment which could be utilized upon maturity thereby enhancing

the socio-economic condition of the local people. While the solution for the overall socio-economic upliftment of the local people is complex, providing them access to high quality planting materials of preferred local tree species would be a major step, as would supporting their forest protection efforts.

Acknowledgment We are indebted to the local people of Butigan for their help and to Forester Anatolio Polinar of the Visayas State University for the scientific names of plant species.

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